Study On The University Innovation System And Its Network Mechanism In An Open System and High-tech Context

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[Abstract] The university innovation system and its network mechanism highlights the interaction of the internal and external factors. The internal factors includes the disciplinary and non-disciplinary aspects, such as the cross-disciplinary paradigm, the students' entrepreneur union and the network community,which are responsible for the communication between different sectors.The originality, creativity, initiative, ethics, professional standard and entrepreneurship are integrated in curriculum and non-curriculum activities.The external factors refers to the collaborative relationship between university,enterprises and governments in the high-tech, global context.The network mechanism aims to keep a dynamic balance and from an ecosystem of innovation from international,national,regional and institutional levels and match human resources,innovative capability and conditions inside and outside dynamically, so as to react more swiftly in a complex situation,self deciding and responsibility taking of different subjects based on trust, criteria and ethics.

[Keywords]university innovation system; network mechanism;open system;trust and confidence; dynamic and ecological system

1. Introduction

The information technology brings about a revolution in teaching, research, producing and business domains.The social software, big data and high-performance computational services, scientific instruments, and arrays of sensors makes academic activities more convenient with high efficacy. While the biotechnology, nanotechnology and artificial intelligent,etc have been integrated in the process-based and product-based innovation and modified the whole productivity chain,creating new opportunities for wealth and job.The high-tech makes capital flow and distribute globally and accelerates knowledge diffusion.

In a knowledge-based time, university plays a more important role in promoting innovation and the sustainable development of individuals,communities,nations and the world.University should preserve and exercise scientific rigor and originality, in a spirit of impartiality and ethics, as a basic prerequisite for attaining and sustaining an indispensable level of quality.[1] University must keep alert with new technology and reflect in teaching, learning, research and infrastructure,so that it can produce high level research outputs and high quality graduates,which are the most important innovative resources.

Students should be put at the center of teaching,and given more opportunities to learn by themselves and by doing,designing,exploring. Students themselves should integrate into the global knowledge society and transcend mere economic considerations to incorporate deeper dimensions of morality and spirituality for the benefit of humanity.

University also takes the responsibility to cultivate qualified employees and excellent engineers, entrepreneurs to change knowledge into value and wealth.University, government and enterprises should take coordinating action.The government makes policy, collecting and distributing funds to support research and innovation, to promote higher level employment.University and academic associations should develop the rigid standard to maintain intellectual authority,exercise their intellectual capacity and their moral prestige to defend and disseminate values as honesty, peace, justice, freedom, equality and solidarity.

In the open system,various subjects are involved in the educational industry chain and form an intelligent, real-time interactive innovation network system. Different types of universities, universities,enterprises and governments interact with each other from domestic and international perspectives, forming a global network and ecosystem. Enterprises collaborate not only with customers, but also with domestic and international suppliers, scientists, technical experts, universities, governments and establish an ecosystem network relationship.

In this paper, the university innovation system is placed in an open system, the internal and external factors are considered and interact in a dynamic ecosystem,in which trust, confidence, efficiency, ethics, accountability are highlighted and practiced. The open innovation system of university is restricted and protected for better performance. The resources are open access and co-constructing, and the idea of university and ethics are guarantee for the scientific, rational and humanistic objectives.

University innovation network also intends to integrate knowledge producing, application and ethics into teaching and research activities.The trust and confidence between different sectors,agents and subjects are basic requirements in the network mechanism. The internal and external conditions,capability,resources and environment are considered and matched dynamically. The internal elements include capability,intellectual capital, the advantages of disciplines, outstanding academics and research project, student resources, library and information resources, cultural, intelligent facilities, laboratory equipment; The external elements include policies, industrial and economic structure, the smart city, the absorbing and converting capability of new knowledge. Government, university, industry sectors and the stakeholders will collaborate and construct the infrastructure and laboratory.

2. Literature Review

The Second Conference on the Triple Helix of University-Industry-Government Relations focused on "the future location of research" and brought together researchers, practitioners, and policy analysts from the three institutional spheres, at multi-national, national, regional, and local levels. In Loet Leydesdorf's report, the Triple Helix thesis is developed into a recursive model. Market selections, innovative dynamics, and network controls provide different codes of communication at the global level. Local translations at the interfaces induce adaptation mechanisms in the institutional arrangements. While two dynamics tend to coevolve into trajectories, a regime of transitions emerges when trajectories can be recombined. The emerging hyper-networks are expected to be in flux.Institutions can then be flexible in temporarily assuming roles of other partners. Niche management and human capital management become crucial.[2]

Michael Gibbons(1994) have characterized this role as follows:"Technology transfer looks more like a soccer game in which the university is a member of a team. To score, the innovation system needs the aid of all its team mates. The ball is passed back and forth among the players who may include business people, venture capitalists…"[3]Universities have an important partnership role to play in the innovation system. Swann (2002) identified that enterprises are more likely be a part of this "soccer team", and work with the science base, if they are doing R&D, and so have the capacity to value information; employ qualified scientists and engineers, who have the capability to understand new information; and lack key personnel, that is, they recognize where they need to bring in outside expertise.[4]

Diana Crane(1972) reveals the key role of the invisible college and highly productive scientists in knowledge discovery, spreading and diffusion in social networks.Invisible college is a small group of scholars in any field who are responsible for the most influential output in that field;[5]

Michael Gibbons,Camille Limoges,etc. (1994)studies the dynamics of science and research in contemporary societies and put forward the new paradigm of knowledge production.They argue that the ways in which knowledge---scientific, social and cultural is produced are undergoing fundamental changes at the end of the twentieth century. These changes mark a distinct shift into a new mode of knowledge production which is replacing or reforming established institutions, disciplines, practices and policies.The identifying features of the new mode of knowledge production are reflexivity, trans-disciplinarity, heterogeneity. These features connect with the changing role of knowledge in social relations. While the knowledge produced by research and development in science and technology is accorded central concern, the authors also outline the changing dimensions of social scientific and humanities knowledge and the relations between the production of knowledge and its dissemination through education;[6]

In 2004, the British Government published a ten-year investment framework for science and innovation. The purpose is to promote outstanding scientific and technological discovery and to turn knowledge into new products and services.The Government sets out an agenda for increasing business-university collaboration to create more routes to bring new skills into businesses and to bring new ideas successfully to the marketplace;to improve the professional development of science teachers; to promote public understanding of and engagement with the science base and stresses the need for regulatory and ethical issues to be considered at the emerging stages of new science.In order to maintain and develop world-class excellence and core strengths, a culture of multidisciplinary research and the underpinning infrastructure and funding mechanisms to support it are taken into account. More cross-disciplinary training will be delivered at undergraduate and postgraduate level, particularly cross-disciplinary PhD program. [7]

Chinese scholar LIN Baokun suggests that university should build a co-operative interdisciplinary and cross campus innovative organizations; and university-enterprise alliance, Union of Scientists and a broad partnership should be considered.[8] WANG Yi,CHEN Jin and XU Qingyi put forward the innovation views: integration,network, coordination, combination, the carrier of knowledge, component, platform, technical ability, etc. [9]Zhao Qingping proposed five part of college innovation system: the base system, development platform system, intermediary system, public service platform system, innovation system and culture construction; [10]Wang Shenyu highlights such features as sign of innovative university: have a culture with strong academic atmosphere and preference; have a reasonable and coherent structure with basic study, applied research and technology development, have the level and potential to keep pace with world technological frontier; build an interdisciplinary guarantee system, have a network of interdisciplinary academic institutions; have formed mutual traction, mutual penetration, co-evolution tendency among universities, industry and government.[11] The university innovation highlights the basic science and technology innovations which link the relevant supporting and auxiliary organizations across universities ,enterprises, government, finance, intermediary organizations and the whole innovation chain, university innovation is in the upstream.[12]

Luo Wei uses a complete information dynamic game model to analyzes the process of cooperation and innovation between universities and enterprises, as well as the innovation practice for universities and industry, how to select the appropriate means of cooperation and partnership based on the characteristics of the resources and capabilities of the partners. [13]

ZHOU Chun-yan, LI Hai-bo points out that the innovation theory of triple helix on academy,industry and government comes from the regional innovation practice. It shows us the nature of regional innovation that is based on knowledge and results in the exploration on new increasing model and new dynamic mechanism on regional development. [14]

Some new trends: (1) to explore innovative networking mechanism in the context of new technology environment, such as intelligent campus, intelligent city, visualization, intelligent learning, big data; (2)study on the university innovation system and networking mechanism based on the new paradigm of open knowledge production;

(3)study on the innovation environment and game relationship of university innovation system. For example, Yuan Qiaoyun points out that the core of knowledge innovation is to establish a synergies open innovation platform supported by Web2.0 environment ,and attract a large number of network users to participate in innovation and interests networks so that knowledge and innovation can increase exponentially. The innovative capabilities of organization originates from the global network of collective intelligence. The social networks also provides a new way for knowledge transfer and innovation.[15]

(4)Wang Zhiqiang analyzes the relationship between knowledge production in university and the innovation system of a more interdisciplinary, diversified network. This relationship has a great impact on research university's innovation performance ,which also reflects the track of knowledge production mode transformation in research universities.[16] The study focused on the transformation of knowledge production patterns and their impact on innovation, but neglecting the quality improving and mutual restrain mechanism.

(5)Wu Yuming believes that the integration of regional innovation environment is formed by the integration of infrastructure, market, government, business, finance, industrial structure, human capital and other factors, and the interaction of university knowledge innovation, which is matched with the innovation input, output and cooperation.[17] This study pays attention to the relationship between the internal and external factors of university innovation and coordinating effect on the innovation ability of University, but not in detail.

(6)Wang Dazhou uses the relevant theory to analyze our enterprise innovation network evolution mechanism,the initial conditions, overall trend, dynamic mechanism, learning mechanism, for enterprises of different original conditions and the role of the government,market in the allocation of resources and the problems, and then analyzes how to deal with various relations to keep dynamic balance.[18]

(7)Zhang Yunyun analyzes the elements and structure of university spin-offs based on heterogeneity, and the internal, external and compounding initiative mechanism based on the forming of knowledge network,the trial and error mechanism, collaborating and enhancing mechanism based on the derivative knowledge network.[19]Luo Wei,etc, analyzes the University and enterprise cooperation innovation process through a complete information dynamic game model.How to choose the appropriate cooperation mode and cooperation partner according to the characteristics of the partners,such as resources and capability.[20]

3. Case Study

3.1 STS Program in Stanford University[21]

Stanford University has a good innovation and entrepreneurship culture, environment and mechanism.It advocates freedom and creation, pay attention to the cultivating students' research ability, critical thinking and initiative spirit, with a mature mechanism of integrating production and research, and strong financial support, incubation with 4 companies, the annual revenue of $2.7. It is good at transforming science and high tech concept into business operation (Google's birth is the beginning of a doctoral thesis at Stanford University). Standford insists on the integrating of teaching and research, strengthening cooperation with the industry. The University Industrial Park, Silicon Valley, gradually formed a integration of open mode of production. It also provides plenty of learning, research and practice opportunities for students. It has 7 schools(Business,Earth, Energy & Environmental Sciences,Education,Engineering,Humanities & Sciences,Law,Medicine), 71 majors and 18 interdisciplinary laboratories, centers and institutes(Independent Laboratories, Centers, and Institutes The Independent Laboratories, Centers, and Institutes provide significant support for interdisciplinary research at Stanford. They involve hundreds of faculty members, administrative, research, technical staff, and students at all levels. These units play a critical role in the Stanford mission of creating and sharing knowledge. Interdisciplinary research centers draw on the strengths of schools and departments across the University.), to provide a superb research condition and resource for students and teachers of different levels and academic background.The specialty and discipline of Stanford University has laid a solid foundation for innovation and entrepreneurial talent cultivation. It provides the advanced knowledge system, which embodies the frontier of knowledge and with cross disciplinary feature. Solid special foundation and flexible innovation transforming mechanism have formed the Entrepreneurship and innovation characteristics.The study is valuable for Chinese research university to reconstruct the majors and disciplines and promote the innovation ability.

3.2 Materials Science and Engineering in Washington University[22]

Materials science and engineering is an interdisciplinary field that addresses the structure, processing, and property relationships in materials for engineering applications. Basic principles of chemistry and physics are applied to provide an understanding of the structure of materials and the manner in which the structure determines the properties. Scientific processing methods are then applied to yield the necessary properties, which then can be integrated with, and designed to accommodate the needs of, modern technology.In the past few decades, at the core of the progress in such diverse fields as transportation, communication, electronics, energy and environment are significant advances in materials. Materials science and engineering is a broad and growing discipline.

Materials Science and Engineering at the University of Washington has recently experienced rapid expansion into new research areas, including polymers, hybrids, biomaterials, biomimetics, nanomaterials, photonic and magnetic materials. These areas have applications in current and emerging industries, and complement existing strength in ceramics, metals, electronic materials, and composites.For example,The Bachelor of Science in Materials Science and Engineering degree with an option in nanoscience and molecular engineering,A minor in materials science and engineering,Bachelor of Science in Materials Science and Engineering.

3.3 University spin-offs[23]

Prominent examples of university spin-offs are Genentech, Crucell, Lycos and Plastic Logic. In most countries, universities can claim the intellectual property (IP) rights on technologies developed in their laboratories. This IP typically draws on patents or, in exceptional cases, copyrights. Therefore, the process of establishing the spin-off as a new corporation involves transferring the IP to the new corporation or giving the latter a license on this IP. For university-based spin-offs, the university serves as a source of competitive advantage providing skilled labour, specialized facilities and expertise but often the partnership with a commercial company is sought right from the beginning of the initiative. Indeed, differently from other high-tech startups, University Spin-Offs face one fundamental obstacle when they are initially launched; originating from a non-commercial environment, most universities and academic entrepreneurs lack those specific resources and skills needed to transform an academic idea into a market-ready product or process innovation.On the other hand, University Spin-Off companies presumably enjoy significant advantages in exploiting technological resources as they possess greater absorption capacity than their non-academic counterparts.Moreover, the connection network, the credibility and the support structure of a University has been found to help University Spin-Offs develop new contacts and expand their social capital.Accordingly, the scientific background and "connectedness" of spin-off founders in the scientific community should facilitate the recognition of external knowledge flows, and their assimilation and application to commercial ends.In addition, marginal returns on internal investments in R&D are likely to be higher for University Spin-Offs than for other innovative startups as a consequence of the technological specialization of their founders acquired in an academic setting. The spin-off founders are, on average, more productive than their academic colleagues; thus, in Universities, entrepreneurship and scientific research are definitively not in conflict.

3.4 Nanotechnology and its application

Knowledge enhanced products or services can command price premiums over comparable products with low embedded knowledge or knowledge intensity. Many researchers have differentiated assembled goods from homogeneous products, like chemicals and materials, which are the output of process industries. Teachers can offer some cases for the students to study and put into practice.

Nanotechnology is often described as the third small-tech revolution and unlike the first two revolutions,nanotechnology is based on the skills inherent in materials science and engineering. The example of Ferrofluids is now considered to illustrate the applicability of the model to nanotechnology-based products.Ferrofluids are one of the oldest commercially available nanotechnology-based systems.The product, a ferrofluid, consists of tiny magnetic particles dispersed in a fluid. The fluid systems is then used to create a number of products such as seals and bearings in applications where leakage, bearing run-out, and thermal issues associated with traditional technologies significantly degrade the end product. Computer disk bearings and fluidics systems to deliver liquid fuel in NASA rockets are two examples of applications of ferrofluids.

Ferrofluidics manufactures a number of different products for different applications all based on slightly different manufacturing processes.Ferrrofluids are not the only nanotechnology in which a change in process results in a simultaneous change in the product. In the case of nanotechnologies, function and performance characteristics are clearly and tightly linked to structure and the structure is tightly linked to the process. Hence, process and product innovation are simultaneous. Having considered a number of examples of traditional process-based products in such industries as chemicals, food processing, engineered materials and an example of an emerging process-based technology – nanotechnologies – a pattern of product and process innovation occurring simultaneously has been identified.

When considering the relationship between product and process innovation it is important to consider the technological nature of the product to ensure that the correct model is applied. This is an important insight that has implications to marketing, R&D,operations and strategy. [24]

3.5 Globalization of the High-Tech Labor Force[25]

For nations such as South Korea, Taiwan, China, and India, that at certain stages of their development have experienced brain drain, but now the education and experience in the United States could potentially be lured back home. The creation of domestic employment opportunities, the government initiative investment strategy, and the growth of indigenous businesses enable the career paths of global nationals to be followed back home, thus transforming a potential "brain drain" into an actual "brain gain".

For decades US ICT companies have been routinely offshoring production activities, usually through foreign direct investment (FDI). Previously offshoring had been driven mainly by the search for low-wage labor to perform relatively low-skill work. New in the 2000s was the extent to which offshoring represented a search for low-wage labor to perform relatively high-skill work. In the 2000s US ICT companies have been able to access an abundance of such labor in developing countries, especially India and China.

Since the 1960s the development strategies of national governments and indigenous businesses in East Asian nations have interacted with the investment strategies of US based ICT companies as well as US immigration policy to generate a global labor supply. New possibilities to pursue high-tech careers, and thereby develop productive capabilities, have opened up to vast numbers of individuals in East Asian nations.Many found the relevant educational programs and work experience in their home countries.But many gained access to education and experience by following global career paths that include study and work abroad, especially in the United States.

4. Conclusion

4.1 Reinforce Academic Standards ,high level research and Cross-disciplinary Strategy

University innovation system should be designed in a frame work of academic standard with core values: the pursuit of truth and freedom, rational spirit and humanistic care, which should be integrated into teaching, research, professional and curriculum standards. The scientific criterion of truth is an internal standard following the internal norms of science and logic, and rigorous methods, procedures, and enhance public confidence in science and research by offering convincing conclusions and evidences.

Research must be enhanced in all disciplines, including the social and human sciences, engineering, natural sciences, mathematics, informatics and the arts. Of special importance is the enhancement of research capacities in higher education research institutions, as mutual enhancement of quality takes place when higher education and research are conducted at a high level within the same institution. These institutions should find the material and financial support required, from both public and private sources.Higher education should reinforce its role of service to society, especially its activities aimed at eliminating poverty, intolerance, violence, illiteracy, hunger, environmental degradation and disease, mainly through an interdisciplinary and trans-disciplinary approach in the analysis of problems and issues.

Academic authority and academic organizations should be established and relatively independent from the administrative power.Students union and professor congress should ensure students and teachers participating in teaching, research, management and training programs.The quality of higher education institutes can be evaluated internally and externally. The internal assessment or audit is usually carried out by the dean of the department and the professor committee according to the objectives and requirement put forward at the beginning of the semester.The external assessment is usually carried out by government, industry sectors,community and research sponsors and see whether the "products" are qualified from relevant customers' requirements, for example,whether the students' knowledge, skills, ability, competency can meet with the requirements of industry sectors, whether the research or project output is practical and valuable,whether can transfer into technology and setup a small enterprise. The "process" evaluation is to see whether the education activities are humanistic and scientific, whether the programs and courses,the resources and supporting conditions are rational,updated and efficient,whether the teachers are responsible,humanistic and competent of teaching and research.The quality standards include international,national and institute's levels and humanistic,academic,practical triple dimensions. Here is an example of the quality function deployment for a course (figure1):

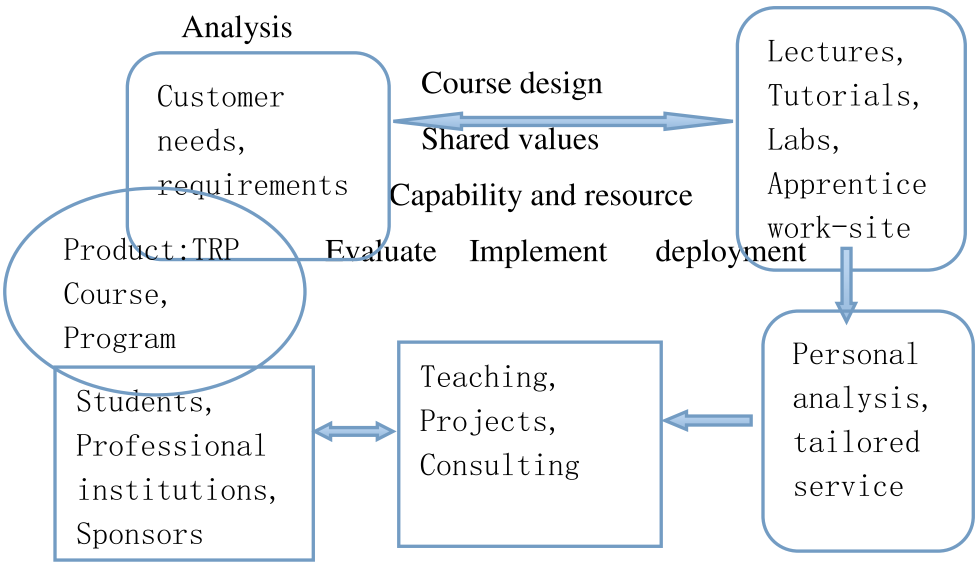

Figure1.Course Designing and Quality Control

High-level research is encouraged in university and try to transfer to application,no matter by spin-offs or by consulting for enterprises or by patent renting or converting. Multidisciplinary programs and teams are welcome. Research Councils (driven by the needs of their research communities) will work with universities and other funders in the public and private sectors wil establish multidisciplinary capabilities in research intensive universities, encouraging collaboration across institutional boundaries, and also the link between teaching and research.

4.2 Open Laboratory and Knowledge Resources ?

Universities' research equipment and laboratories,as well as expertise and facilities should be maximized and open to access by community,enterprises and business. Series of collaborative R&D program and knowledge transfer networks will be adopted by university, enterprises and government.Some priority technologies of new and renewable energy technologies,technologies for environmentally friendly transport, advanced (composite) materials and structures, inter-enterprise computing,sensors and control systems, disruptive technologies in electronics and displays,and bio-processing should be integrated in discipline knowledge system and in process-based,product-based innovation.In order to increase the efficiency of collaboration between university and enterprises and maximize the investment,a relevant evaluation of the research projects or apprenticing agreement must be carried out,and the university intellectual property must be clarified when commercialized.The government should put aside fund for permanent innovation capability and knowledge transfer, and put in place resources to encourage scientists and engineers to turn basic and strategic research into successful new products and services, and to engage more fully with business. To increase the number of business-credible staff in university technology transfer offices and to invest in the training of knowledge transfer professionals and innovative projects.Teachers and experts can act as consultants by creating innovative solutions to real-world problems and needs, and transfer new knowledge and technology to enterprise.University teaching and research should link with business in communities of practice or with the help of big data, 3D technology and visualized producing.

4.3 From Brain Drain to Brain Gain:Challenge from Global HR Flowing

The"brain circulation" emphasize on human capital circulation across nations in the global market, benefiting both the sending and receiving nations; in addition it is considered a two-way flow of skill, capital, and technology, unlike brain drain and reverse brain drain.High-skilled migration brings important economic benefits. Migrants fill key skill gaps and are a source of innovation and enterprise.The cross national companies take the advantages of worldwide research resources, and attract globally dispersed scarcity of top talents. By the end of 2001, the research institute set up by multinational companies in China has surpassed 110.Many talents in domestic universities, research institutions and high-tech medium-sized enterprises are attracted by multinational corporations preferential treatment and working environment, which exacerbated the state-owned enterprises. The capability and environment of Chinese universities are too limited to attract foreign students and experts to cooperate in science and technology. While number of students going abroad studying at their own expense increases at the rate of 20% per year but the return rate is low.This leads to great economic loss.

To reverse the trend ,Chinese government and universities,enterprises can select skilled, adaptable individuals who are likely to make a substantial economic contribution to the country,allowing high-skilled individuals the opportunity to come and look for work or to start up their own businesses. As the market for scientists has become increasingly global, high quality scientists and foreign science and engineering graduates studying in specific shortage subjects in China will have the automatic option of working in China after graduation. The government will provide rewarding opportunities for those who have attained knowledge and skills from overseas, implementing new contracts, scholarships, encouraging students to pursue tertiary studies abroad and promoting them to return, and act as bridges for foreign investment and trade, and facilitate the transfer of skills and knowledge.

Chinese university should improve the quality and attract more oversea students and experts to work and cooperate in research and developing projects.First, improve the teaching quality,set up a high-level, international curriculum system and tailored service for foreign students, establishing good reputation world-wide. The students will feel comfortable, convenient,valuable in and post graduation. Once the quality is identified widely Chinese universities will be attractive to foreign students and experts.

Secondly, we should improve the environment and learning,research conditions, respecting multiple cultures, offering a variety of services, reasonable fees, the corresponding teaching HR and advanced, various courses; Thirdly,we can offer more opportunities and some priority for the oversea students and experts to initiate new companies in China and experience success.A reciprocity and trust relationship should be established in the cooperation and get a win-win effect both in academic and economic fields. Some traditional superior courses and programs should be strengthened and spread world-wide,forming some cultural industries and educational industry clusters and value chains. With the help of big data and Mooc, social software, and linking to things, Chinese university will learn from the world famous universities and surpass them in many fields, and integrate some prominent scientific discoveries and inventions into the course and products and to accelerate knowledge absorptive capacity and innovation capacity.

Finally, to develop an international standards and rules in HR, knowledge, technology,profession and business, and cultivate international talent who have not only language and culture superiority but also disciplinary and trans-disciplinary advantages and can act as consultants, to be a bridge to introduce Chinese university aboard and attract more oversea students. The research cooperating and visiting scholars programs will promote knowledge producing, diffusion,conversion and professional development of the staff.

4.4 Different Mission, Different Feature,but all educate for excellent

There are different types of higher education institutes, such as research, teaching, and entrepreneur categories in general. Different institutions have different context and different missions.For example,the research university emphases on the creativity,originality and advanced science and technology learning and exploring.The teaching and entrepreneur universities emphasize on the initiative and entrepreneurship spirit and enhance the link between university and working sectors. But all should be educated for excellent.

The traditional classroom teaching would integrate knowledge instruction with big data, 3D manufacturing and visualizing technology. Task, project or problem-based approaches are used frequently to improve the learning efficiency and efficacy.Students can fulfill the task or solve the problems with team members,from which they can consolidate knowledge,skills,improve competency and experience success,friendship and confidence.Teachers can guide the students to think like scientists, putting forward hypothesis,and finding some evidence to prove it right or wrong,then drawing a conclusion which can be transferred to the related areas and used flexibly in authentic situations.The methodology training is very important for both natural and social science students,as well as for philosophy and art students.Through project-based learning,the students can learn by doing and link theories with workplace experience,which can help them to be adapt to the work swiftly after graduation and work creatively afterwards. The enterprises should keep a close relationship with academic institutes and absorb new knowledge.By the media of entrepreneurs,knowledge and research can be converted into productivity and wealth through business approaches.(figure3)

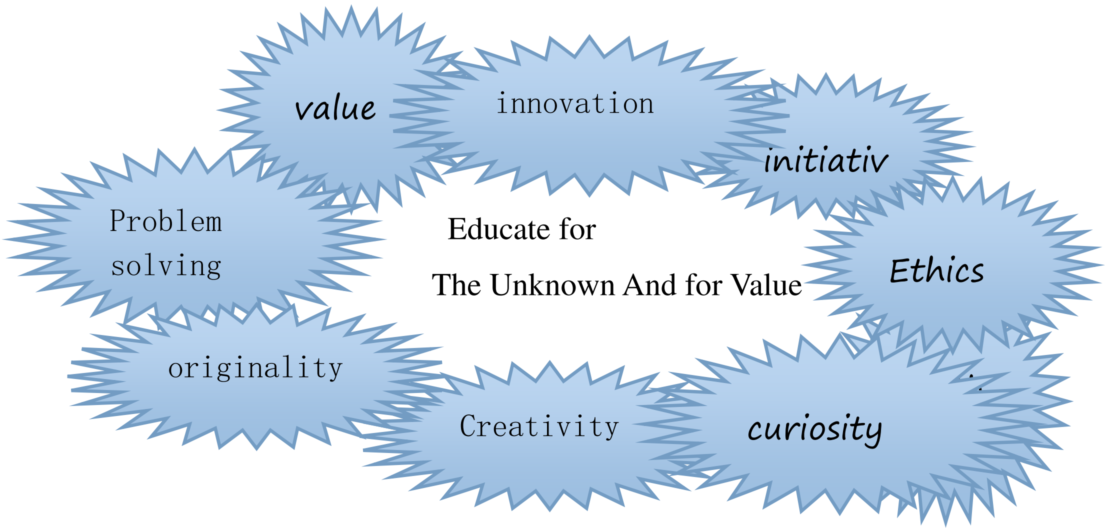

Figure3.Educate for The Unknown and for Value

Teaching,research and application can be integrated and promote with each other in university system.The curriculum and disciplinary modification should reflect new science and technology, especially some prominent discoveries, as nanotechnology,bio-technology and computer science and artificial intelligent.Such kind of knowledge can be integrated into the knowledge system, integrated into product-based process and bring an incremental or disruptive innovation.It can also be integrated in the productive chains. Teachers mainly play the roles as tutors and consultants or co-operators.Some open learning initiatives are developed by specialists as cognitive scientists,software engineers and disciplinary specialists.

If the mission of the institute is to cultivate qualified employees,the process and activities will focus on the students' competency requirements from the external working sectors and citizenship,and to facilitate the acquisition of skills, competences and abilities for communication, creative and critical analysis, independent thinking and team work in multicultural contexts,where creativity also involves combining traditional or local knowledge and know-how with advanced science and technology. Curriculum plan, courses package, content selection are continually tailored to the present and future needs of society.All factors that influence students development within and outside the institutes should be considered.The teacher qualification, faculty, service and expert system as well as other knowledge resources and culture influences,architectures,net of things,etc,should match with the function and mission of the institutes.(figure2)

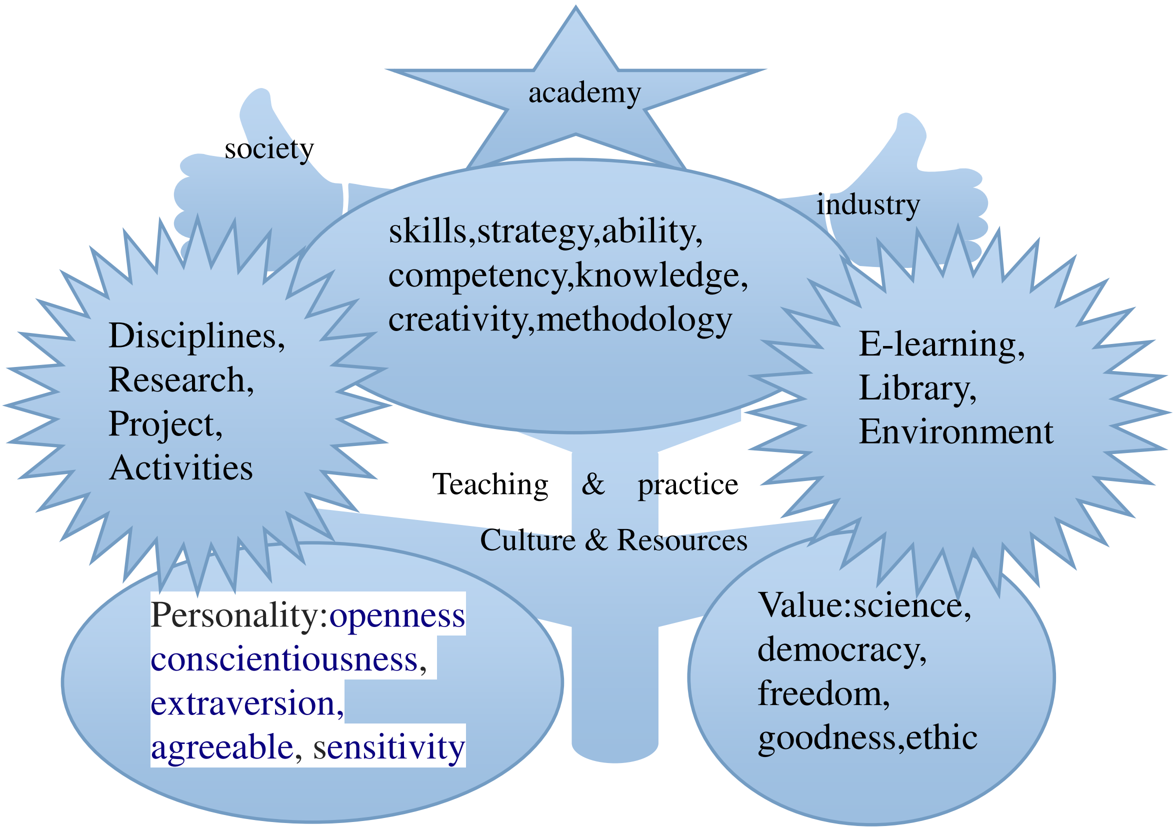

Figure2.University System and Activities for Excellent

4.5 Enhance Collaboration

Collaboration inside and outside the university will be enhanced.In the university,the cross-disciplinary teams and programs,the entrepreneur union and network community play more and more important role in innovation.The university,spin-offs,enterprises and government will collaborate and form a ecosystem network mechanism of innovation.The mechanism makes decision making and reaction more swiftly and efficiently,promoting creativity and knowledge diffusion,even feedback from market and innovation from the public.

Employers will contribute to identifying the specialist and generic skills required to meet their current and future business needs –particularly those which will improve business performance, productivity and competitiveness. In turn, the supplying sectors – university and work-based learning –will be increasingly flexible in meeting with the skill requirements identified by employers,making it more responsive to what employers want, giving them opportunities to shape training provision and coherent progression routes.

The Government is committed to ensuring that these partnerships make the system simplified and efficient to the goal. A range of initiatives can be launched, including work with university and research branches to promote knowledge producing and diffusion to industry.To ensure that scientists and engineers emerge from universities with an understanding of the context in which research can be capitalized and promoted.To follow the new National Occupational Standards and to improve relevant aspects of qualifications. To provide people with clear,flexible and accessible routes into special field. To use the flexibility and work-based learning and to develop internal talent to meet their technical and managerial needs. The university spin-offs can act as a media to enhance the linkage between university and enterprises to know more about the requirements,the standards and the technology, product life cycle,etc and help the university to adjust the curriculum and research programs.

4.6 Consider Life Cycle of Science,Technology and Product

Scientific revolutions promoted development in mathematics, physics, astronomy, biology and chemistry transformed views of society and nature,which are quickly integrated in curriculum and teaching methods.Technological revolution means when one technology or a set of technologies is replaced by another technology or by the set of technologies. It brings about not only by new innovations but also their application and diffusion. A new technological revolution may involve not only material changes but also changes in management, learning, social interactions, financing, methods of research etc. Technological revolution so rewrites the material conditions of human existence and also reshape culture, society and even human nature. It can play a role of a trigger of a chain of various and unpredictable changes.[26]

Industry 4.0 tech is integrated in auto-manufacturing with big data,digital, nano-tech, 3D and visualized technology and brings manufacturing renaissance in advanced countries. While their out-dated patent and technology have been transferred to developing countries through oversea students,scientists and cross companies. For example the semi-conductor technology and automobile industry have been transferred in Asia in recent years, initially in the southeast coastal regions , then shifted to densely populated inland areas, which stimulating mass consumption and price advantage by embedding new technologies and led to the rapid development in transportation, commodity logistics and estate and other related industries.

Accordingly, the university's mechanical design and manufacturing, logistics, real estate, materials science, environmental and urban planning as well as resources and occupations in such areas are in large demand. New knowledge and high technology should be integrated in education and industry and to improve the quality of students' competency, to enhance employment and innovation.

For example,American bio-medical technology is flourishing in the 20th Century ,with the world largest bio-pharmaceutical market share, the largest bio-pharmaceutical patents, the largest biotechnology laboratories and technology platforms, leading the development of the whole world bio-medical industry. Europe has the world's largest number of bio-pharmaceutical companies, world-famous French gene valley, and even Japan biotechnology industry statehood proposed strategy, bio-medical triggered a global craze.

Accordingly, the updated knowledge innovation universities, professional and curriculum and subject knowledge to be conducted at professional training and curriculum customized package designed according to a major discovery, key technology and its industrial chain and employment forecast demand for expertise and customized programs training programs, and technology industries to achieve seamless.

As for the innovation cycle,at earlier stages of the innovation process, companies may work with other organizations that offer them the opportunity to monitor a wider portfolio of research and to gain access to specialist skills. Doing this helps them to innovate more efficiently and to avoid the risk of a narrowly-defined research portfolio.Some emphasize that this is the key part of the 'open model', which innovation systems are moving towards,where working in partnership with other innovators and the science base is important for germinating the most promising ideas. This is different to pure outsourcing of research, which has an earlier tradition, where there is less opportunity for the cross fertilization of ideas and a narrower range of research avenues.

4.7 Reinforce Science Ethics and Confidence of The Public

Science and technology are for goodness purpose, which are making our lives healthier, easier and more comfortable. However, there is sometimes unease about scientific and technological developments. The higher education institutes should take the responsibility to reconstruct public confidence and engagement in science. To give public priorities and concerns;having greater confidence in the benefits offered by science;supporting science activities that can achieve a positive national impact;undertaking new research to identify public attitudes to science and scientists;investigating whether the public is getting what it wants from public engagement; and promoting best practice in the work of science and technology, and provides opportunities for people of all ages to take part in activities, including hands-on experiences with science, lectures, demonstrations and debates and dialogues on topical science-related issues;

Set science festivals and attract the best scientists to discuss the latest developments in research with a wider audience,to make science exciting, accessible and relevant to people, provide support for teachers and science club leaders, organize public forum where the ethical, health, safety and environmental impact of new science and technologies can be debated so that the public can know more and have opportunity to express their puzzles and requirements.To address public and business concerns and priorities arising from new areas of science and technology, for example research into aging, neuroscience, environmental technology, nanotechnology, the long-term implications of intelligent and pervasive information technologies.Whether nanotechnology raises any ethical, safety, health or environmental issues that are not covered by current regulations,there is a need to introduce new regulations.To establish and maintain public confidence in making better choices about critical new areas in science and technology.

5. Summary

In a global and high-tech driven time,university should promote change and be adapt to change actively, and play a key role in knowledge producing,sharing and converting, to advocate democracy and freedom, reconstructing confidence in science of the public. To ensure higher education quality through top and lean teaching and research program and reinforce link between university, government, and enterprises. Rigid academic standard,research ethics, interdisciplinary training and internalization should be integrated in undergraduate,master and PHD programs and curriculum tailored.

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